Projection x-space magnetic particle imaging.

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Public Summary:
Projection magnetic particle imaging (MPI) can improve imaging speed by over 100-fold over traditional 3-D MPI. In this work, we derive the 2-D x-space signal equation, 2-D image equation, and introduce the concept of signal fading and resolution loss for a projection MPI imager. We then describe the design and construction of an x-space projection MPI scanner with a field gradient of 2.35 T/m across a 10 cm magnet free bore. The system has an expected resolution of 3.5 x 8.0 mm using Resovist tracer, and an experimental resolution of 3.8 x 8.4 mm resolution. The system images 2.5 cm x 5.0 cm partial field-of views (FOVs) at 10 frames/s, and acquires a full field-of-view of 10 cm x 5.0 cm in 4 s. We conclude by imaging a resolution phantom, a complex "Cal" phantom, mice injected with Resovist tracer, and experimentally confirm the theoretically predicted x-space spatial resolution.

Scientific Abstract:
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